EBIS / Helium 3

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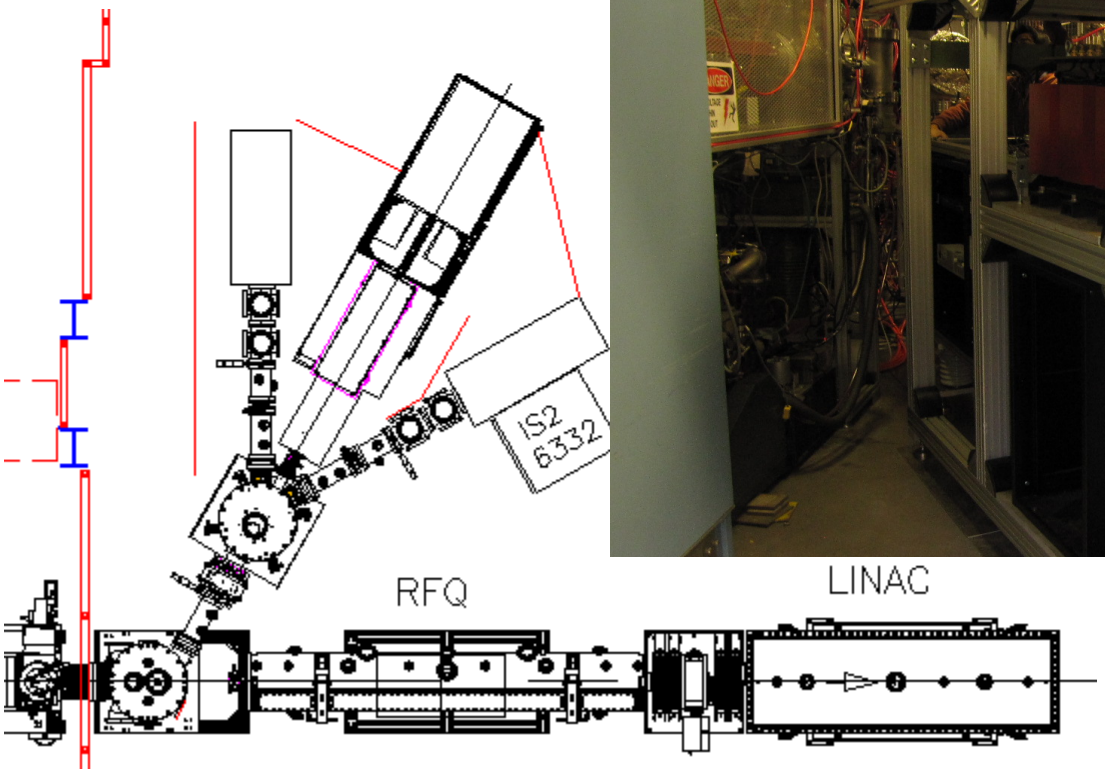
5/20/14

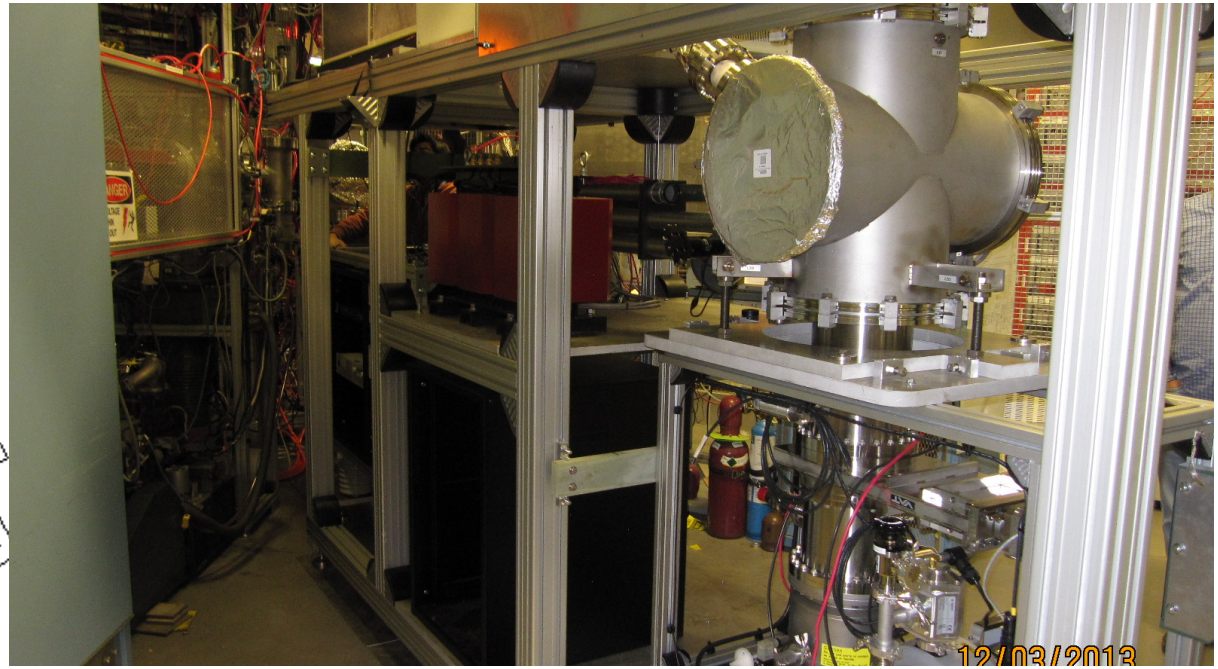
- EBIS has been running Au 24/7 since January 25.
- In parallel, EBIS has also provided all beams for NSRL (except protons).
  - 8 species (C, O, Si, Ti, Fe, Kr, Ta, Au)
  - no restrictions on NSRL running

The new Laser Ion Source (LION) has also been commissioned during this period.

New way of providing 1+ ions for injection into the EBIS trap/charge breeder. More versatile.

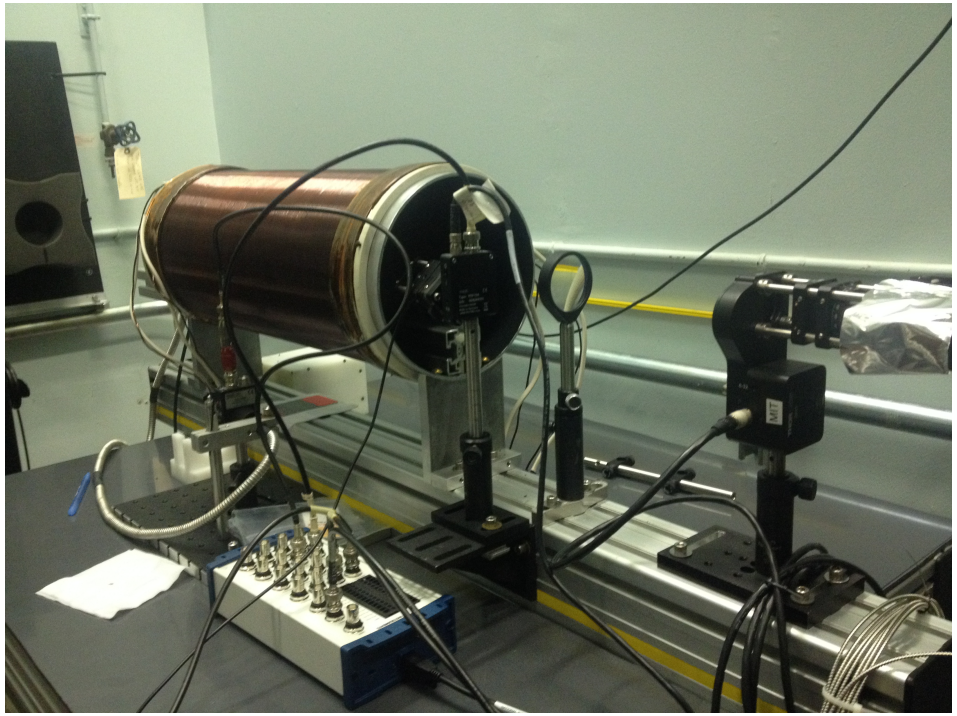
<u>Now being used routinely</u>. All NSRL ions have used the LION/EBIS combination for ~ the past month – C, Si, Ti, Fe, Ta.

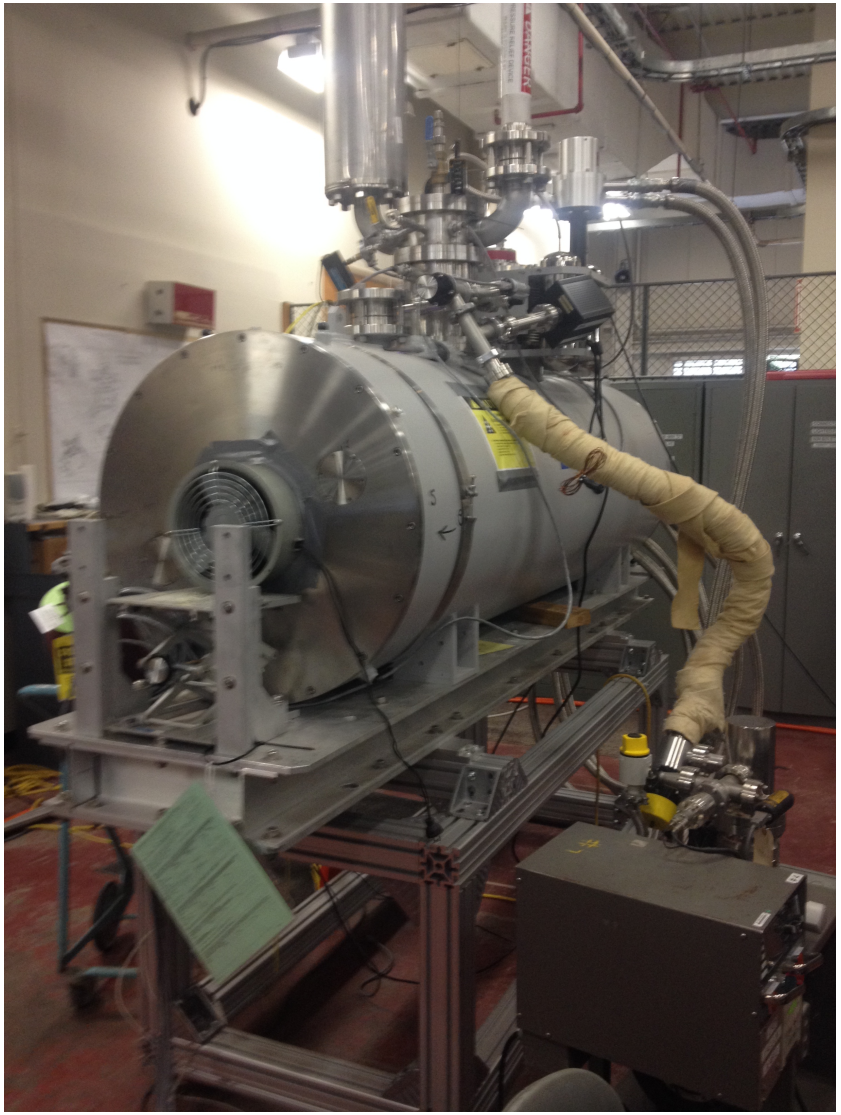




- Future - use EBIS for polarized He-3
- Ongoing R&D - BNL/MIT collaboration

Pumping cell for producing polarized He-3, and spare EBIS solenoid to be used for upcoming tests.





Helium 3

^{3}He vs. NSRL/^{4}He - difference is gas consumption

We've done ^{3}He before (studies for future polarized).

What makes Au-^{3}He different?

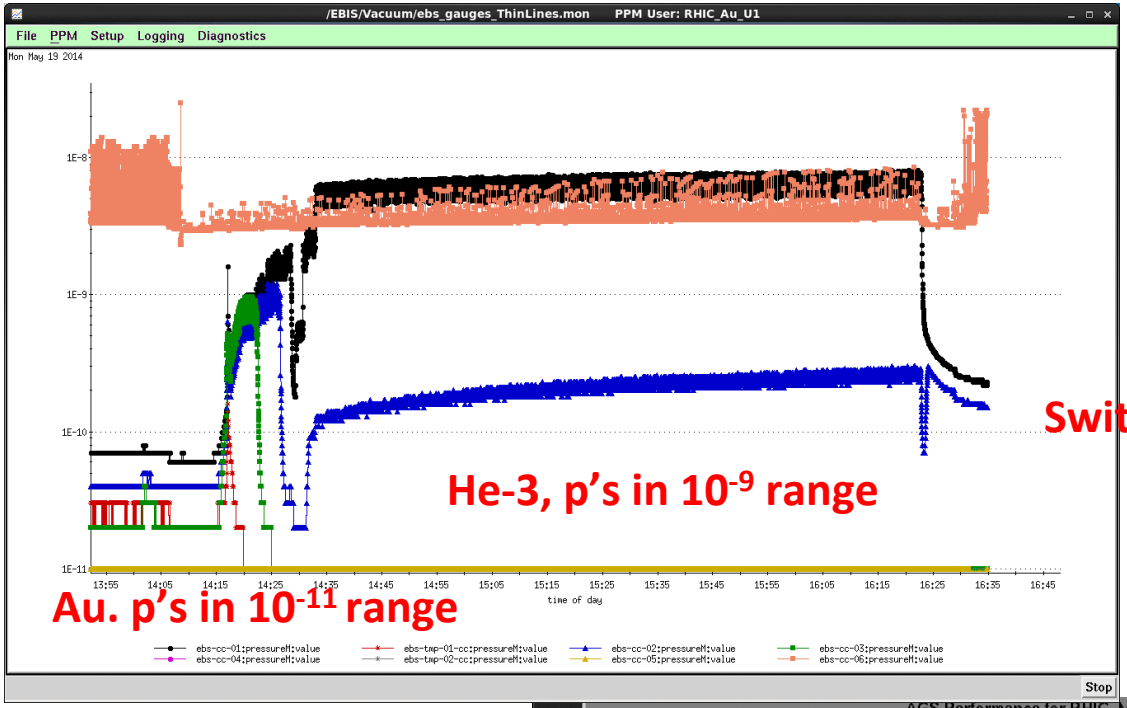
For high charge state heavy ion production (ex. Au^{32+}), you need a good vacuum in the EBIS trap (10^{-11} range).

For He-3 ion production, we bleed He-3 gas into the EBIS, to a pressure of a few 10^{-9}

Issue is the switching time from He-3 back to Au (vacuum recovery)

Other issues in switching

- Helium can increase the likelihood of discharges in the EBIS (lots of high voltages)
- Practical - different vacuum interlock levels, pumping configurations, etc.)



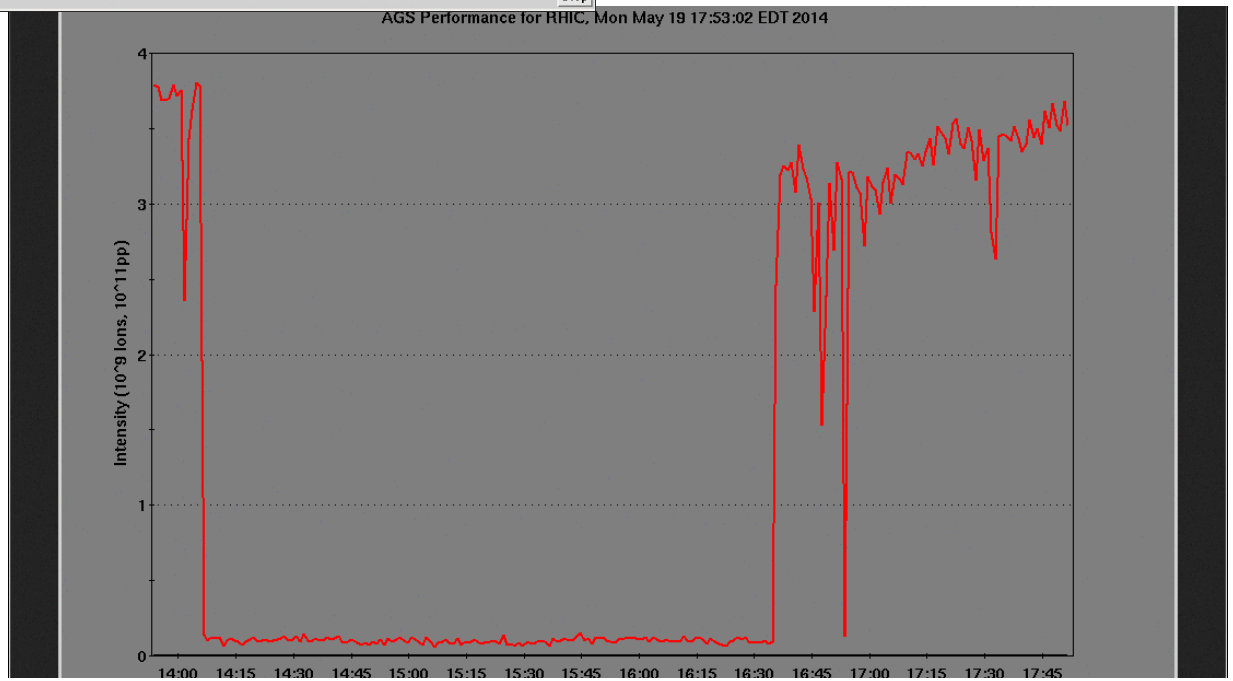
Vacuum in EBIS electron gun (black) and trap (blue)

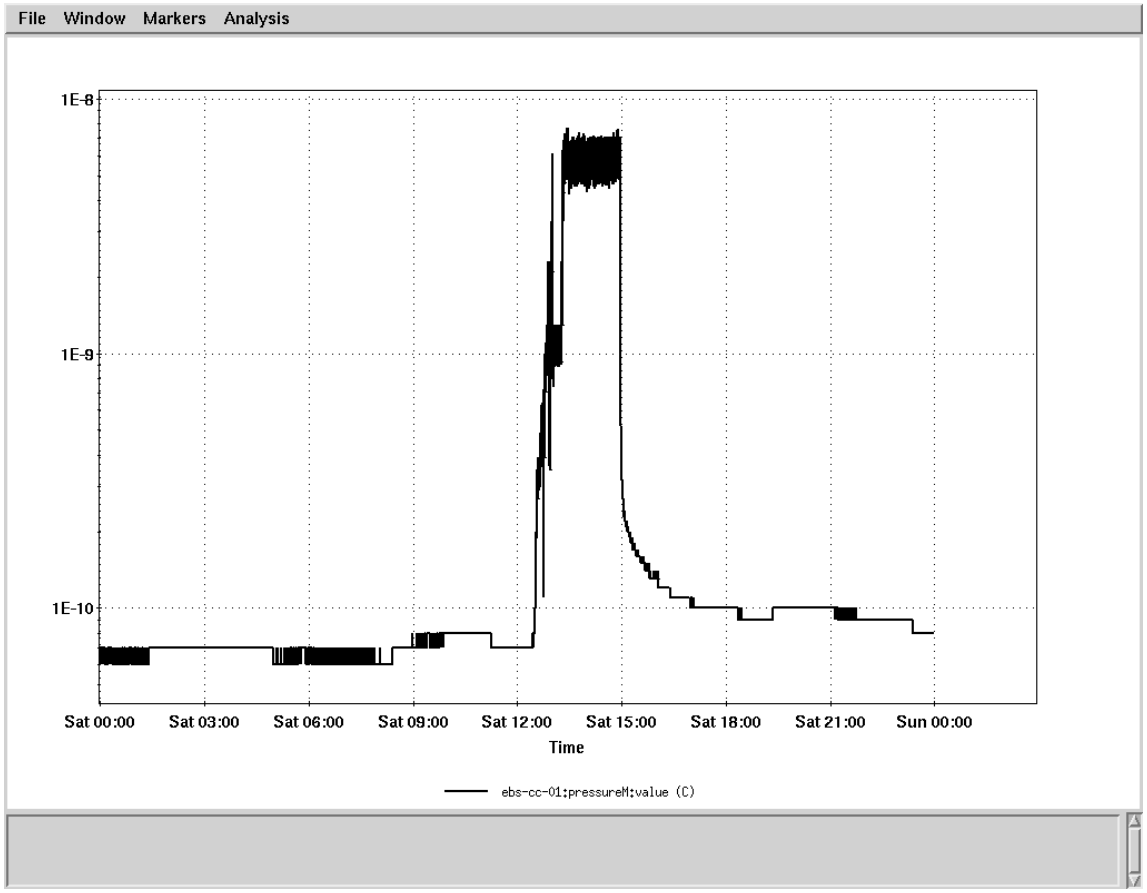
Switching back to Au

He-3, p's in 10^{-9} range

Au. p's in 10^{-11} range

AGS output
(left is normal fill, and right is recovery after running helium for 2 hours.





We should understand the issues better after this week of testing.

Do Au first, then He for fills in June.

(and try not to make a mistake, so you don't need to go back to Au after He)